**Residual Plots - To test whether the association is linear**

Plot the explanatory variable (*x-axis)* against the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *(y-axis).*

Some residuals will be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (those for which the plotted point is above the regression line) and some will be **negative** (those for which the plotted point is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the regression line.)

To interpret this graph, you look at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the residuals.

If the linear regression model is a good fit, then the residual plot will have \_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ will be scattered \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ about the horizontal axis. The residuals will also be relatively \_\_\_\_\_\_\_\_\_\_\_\_\_.

If the residuals displayed a pattern (mostly positive in some domains of the graph, mostly negative in others) then this would indicate the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ regression model is not appropriate.

Something else is going on. A \_\_\_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ model may provide a better fit to the data.

**YOUR TASK:**

1. **In your exercise book, rule up a pair of axes and plot the residuals of our class’s heights (on y-axis) against length of forearm (on x axis).** *Use the data to the right.*
2. **Describe what your residual plot shows, and explain what it tells us about the relationship between the length of our forearms and our height.**
3. **Swap with your neighbour and see if you both wrote the same comments. Did you both reach the same conclusion?**
4. **Read NuLake page 251 (notes and examples about residual plots).**
5. **Do NuLake pages 252 & 253. Complete for HW (due Monday).**

|  |  |  |  |
| --- | --- | --- | --- |
| ***x*  Length of Forearm (cm)** | ***y*  Height (cm)** | ***ŷ*  (height predicted by model) *ŷ* = 3.9457*x* + 67.037**  **(rounded to 4sf for ease of use)** | **Residuals (prediction error) *y - ŷ*** |
| 26.2 | 170.5 | 170.4 | 0.1 |
| 27 | 169.6 | 173.6 | -4.0 |
| 27.5 | 171.6 | 175.5 | -3.9 |
| 27.6 | 169 | 175.9 | -6.9 |
| 27.8 | 174.8 | 177.1 | -2.3 |
| 27.9 | 183.4 | 177.1 | 6.3 |
| 28 | 171.3 | 177.5 | -6.2 |
| 28 | 176.5 | 177.5 | -1.0 |
| 28 | 177.5 | 177.5 | 0.0 |
| 28 | 177.7 | 177.5 | 0.2 |
| 28 | 178.2 | 177.5 | 0.7 |
| 28 | 179.3 | 177.5 | 1.8 |
| 28 | 184 | 177.5 | 6.5 |
| 28.2 | 187.2 | 178.3 | 8.9 |
| 29.3 | 181 | 182.6 | -1.6 |
| 29.5 | 184.4 | 183.4 | 1.0 |
| 32 | 198.1 | 193.3 | 4.8 |
| 34.4 | 198.3 | 202.8 | -4.5 |